

CLAIMS

What is claimed is:

1. A computing apparatus comprising a processor operatively coupled to a memory, said memory having a data structure stored therein representing a set of summarized metrics of a plurality of data elements, said data structure comprising:
 - (a) an indication of an average value of said plurality of data elements;
 - (b) a count value indicating a number of data elements in said plurality of data elements;
 - (c) an indication of a minimum value and a maximum value of said plurality of data elements; and
 - (d) an indication of a standard deviation of said plurality of data elements.
2. A computing apparatus in accordance with Claim 1 further configured to obtain performance measurements of a storage area network and to determine values for said plurality of data elements using the performance measurements.
3. A computing apparatus in accordance with Claim 2 wherein said indication of an average value of said plurality of data elements is an instance of an object comprising a stored alterable value of a primitive numeric type, said object thereby being a MutableNumber object.

4. A computing apparatus in accordance with Claim 3 wherein said indication of said minimum value and said maximum value is an instance of an object comprising two instances of MutableNumber object.
5. A computing apparatus in accordance with Claim 4 configured to perform computations using said instances of MutableNumber objects in accordance with the primitive numeric type stored therein, and to change values stored in said MutableNumber objects without changing said primitive numeric types.
6. A computing apparatus in accordance with Claim 2 further configured to utilize said data structure to produce at least one of a performance summary of the storage area network or a prediction of the performance of the storage area network.
7. A computing apparatus in accordance with Claim 6 wherein said performance measurements comprise available storage and corresponding elapsed times.
8. A computing apparatus in accordance with Claim 6 wherein said memory further has stored therein an instance of an object comprising an ordered set of data elements and values representing a Y-intercept and slope of a best fit linear relationship of said ordered set of data elements.

9. A machine readable medium or media having recorded thereon instructions configured to instruct a computing apparatus having a processor and memory operatively coupled to the processor to store in the memory a data structure comprising:

(a) an indication of an average value of a plurality of data elements;

(b) a count value indicating a number of data elements in the plurality of data elements;

(c) an indication of a minimum value and a maximum value of the plurality of data elements; and

(d) an indication of a standard deviation of the plurality of data elements.

10. A medium or media in accordance with Claim 9 further having recorded thereon instructions configured to query a storage area network for performance data, and to determine values of the plurality of data elements using the performance data.

11. A computing apparatus in accordance with Claim 10 further having recorded thereon instructions configured to instruct the computing apparatus to store an instance of a object comprising a stored alterable value of a primitive numeric type as said indication of an average value, said object thereby being a MutableNumber object.

12. A medium or media in accordance with Claim 11 further having recorded thereon instructions configured to instruct the computing apparatus to store an instance of an object comprising two instances of said MutableNumber objects as said indication of said minimum value and said maximum value.

13. A medium or media in accordance with Claim 12 further having recorded thereon instructions configured to instruct the computing apparatus to perform computations using said instances of MutableNumber objects in accordance with the primitive numeric type stored therein, and to change values stored in said MutableNumber objects without changing said primitive numeric types.

14. A medium of media in accordance with Claim 10 further having recorded thereon instructions configured to utilize said data structure to produce at least one of a performance summary of the storage area network or a prediction of the performance of the storage area network.

15. A medium or media in accordance with Claim 10 wherein the instructions configured to query a storage area network for performance data are configured to query the storage area network to obtain measurements of available storage and corresponding elapsed time.

16. A medium or media in accordance with Claim 14 further having recorded thereon instructions configured to instruct the computing apparatus to store in

memory an instance of an object comprising an ordered set of data elements and values representing a Y-intercept and a slope of a best fit linear relationship of the ordered set of data elements, said object thereby being a LinearRelationship object; and to utilize said instance of said LinearRelationship object to indicate a summary of said performance data.

17. A method for storing a set of summarized metrics of a plurality of data elements comprising storing in a memory operatively coupled to a processor:

- (a) an indication of an average value of the plurality of data elements;
- (b) a count value indicating a number of data elements in the plurality of data elements;
- (c) an indication of a minimum value and a maximum value of the plurality of data elements; and
- (d) an indication of a standard deviation of the plurality of data elements.

18. A method in accordance with Claim 17 further comprising querying a storage area network for performance data, and determining values of the plurality of data elements using the performance data.

19. A method in accordance with Claim 18 wherein the indication of an average value of the plurality of data elements is an instance of an object comprising a stored alterable value of a primitive numeric type, said object thereby being a MutableNumber object, and the indication of the minimum value and the

maximum value is an instance of an object comprising two instances of the MutableNumber objects.

20. A method in accordance with Claim 19 further comprising utilizing said data structure to produce at least one of a performance summary of the storage area network or a prediction of the performance of the storage area network.